33 C.F.R. 331.7(e)(3) REQUEST BY THE STATE OF ALASKA FOR INVITATION TO ATTEND APPEAL CONFERENCE

Affected Party (permit applicant): ConocoPhillips Alaska, Inc.

File Number: POA-2005-1576

Appealed Action: Permit denial for the CD-5 Alpine Satellite Development, Colville River Unit, Alaska

Decision Date: February 5, 2010

Appeal Date: April 2, 2010

Contact Information: Please direct communications regarding this request and appeal to:

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STATEMENT IN SUPPORT OF STATE ALASKA'S REQUEST

The State of Alaska hereby requests an invitation to participate in the appeal conference and further proceedings regarding ConocoPhillips Alaska Inc.'s ("CPAI") Administrative Appeal of the United States Army Corps of Engineers' ("Corps") February 5, 2010, Record of Decision ("ROD"). 33 C.F.R. 331.7(e)(3) permits participation by third parties, specifically, "adjacent property owners. . .or state agency personnel to clarify elements of the administrative record" in an administrative appeal from a Corps permit denial.

As the landowner of the river bed of the Nigliq Channel, which is the proposed site for CPAI's bridge or the Corps' horizontal directional drilling alternatives, the State has a direct, immediate interest in the Corps' permit decision. The State also has an economic interest in the CD-5 Alpine Satellite Development, which is impacted by the Corps' decision. The State's economic interests include the additional taxes and royalties it would receive from development in the Alpine satellite fields, as well as additional jobs for its citizens and improvement in the local economic base, including increased employment, community cohesion, community services, and property values.

Finally, the state has a vital interest in the potential impacts of CD-5 development on local subsistence users, fish, wildlife, and water quality in Alaska and in minimizing adverse environmental impacts to the Colville River Delta area from oil and gas development. Thus, the State brings a unique and balanced perspective to the issues. The State's input is essential to clarify elements of the administrative record.

I. The State Has A Significant Interest As The Owner Of The Land Where The Proposed Bridge Or, Alternatively, A Horizontally Drilled Pipeline Would Be Located.

CPAI proposed constructing a bridge across the Nigliq Channel in order to develop hydrocarbon accumulations in Alpine satellite drill sites and to transport three-phased produced fluids to existing facilities at Alpine for separation and other processing.

The State owns subsurface rights affected by CPAI's proposal, specifically oil and gas leases ADL387208 and ADL380075. The State is also the surface owner of the waterbed of the Nigliq Channel of the Colville River, having received title to the bed of the Colville River on November 23, 1964, pursuant to section 6(b) of the Alaska Statehood Act of July 7, 1958. As a landowner, the State has an important interest in protecting the value of its land. Further, areas immediately surrounding land and stream crossings are by far the most sensitive ecological habitats and the most difficult for spill cleanup.

The state's ownership of the Nigliq Channel is especially significant here because the channel crossing lies at the heart of the disagreement between the parties. The Corps District Engineer and the Environmental Protection Agency (Region 10) support horizontal directional drilling ("HDD") under the Nigliq Channel, while the surrounding landowners, including the State, the Arctic Slope Regional Corporation, and Kuukpik Corporation; affected subsistence users, including Alaskan Natives in the City and the Native Village of Nuiqsut; the North Slope Borough; and CPAI strongly endorse building a bridge across the Nigliq Channel. It is significant that all of the owners of the land affected by the project, the State, Kuukpik Corporation, and the Arctic Slope Regional Corporation, support CPAI's proposal. This is notable because the landowners have different concerns and represent constituencies with different interests, all of which were satisfied with CPAI's proposal.

The ROD failed to give deference to the State's interests as landowner of the affected property, as required by 33 C.F.R. 320.4(a).[1] Instead, the District Engineer ignored the State's careful review and approval of CPAI's proposed bridge crossing in deciding that HDD installations were the less environmentally damaging practicable alternatives ("LEDPA").

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[1] "All factors which may be relevant to the proposal must be considered including the cumulative effects thereof: among those are . . . considerations of property ownership and, in general, the needs and welfare of the people." 33 C.F.R. 320.4(a).

II. The ROD Fails To Demonstrate That The State's Approval Of The CPAI Bridge Plan Should Be Overridden.

The administrative record demonstrates that the State of Alaska conducted exhaustive reviews of CPAI's Nigliq Channel crossing proposal, including numerous meetings with CPAI to discuss possible effects from the construction phase as well as from the permanent bridge structure. For example, the Alaska Department of Natural Resources ("DNR") began reviewing the CD-5 plan in 2003 for its potential impacts to subsistence users, fish, wildlife, and water quality, as part of the federal Alpine Satellite Development Plan Environmental Impact Statement (ASDP EIS). The DNR Office of Habitat Management and Permitting also reviewed the plan to determine its potential effect on fish and wildlife in the area.

On December 13, 2005 the DNR Office of Project Management and Permitting issued the Final Consistency Determination for construction of the CD-5 project including a bridge across the Nigliq Channel located proximate to the existing CD-2 facility. On December 19, 2005 the DNR Office of Habitat Management and Permitting (now the ADF&G, Division of Habitat) issued all Fish Habitat Permits necessary for construction of the project including construction of the Nigliq Channel bridge.

The other land owners and local Native communities engaged in extensive negotiations with CPAI. As a result of those negotiations, the ASDP EIS process, and the State's permit review process, CPAI changed its plans and moved the bridge to an area just north of the CD-4 pad, a move that satisfied the Native communities' concerns about a bridge's possible effects on hydrology, subsistence, and historic landmarks in and around the Nigliq Channel.

The State then conducted another thorough and rigorous review of CPAI's revised proposal to determine whether it was consistent with the Alaska Coastal Management Program. The State's review and evaluation included input by the Alaska Departments of Environmental Conservation, Fish & Game, and Natural Resources, as well as the North Slope Borough Coastal District. On July 13, 2009, the State's Division of Coastal and Ocean Management concluded that the revised project was consistent with the Alaska Coastal Management Program. In particular, the Division determined that the Nigliq Channel bridge and connecting road were, "designed to limit impacts to natural drainage patterns and river flow." The Division also found that, "[e]xtensive habitat, fish, bird, wildlife and hydrology studies of the project area were performed and were characterized in the ASDP EIS" and that the project, "will not introduce barriers to movement of caribou or other wildlife and will not substantially affect subsistence users' ability to access fish or wildlife."

On July 17, 2009, the Alaska Department of Fish & Game Division of Habitat ("Division of Habitat") issued a permit to CPAI to construct a bridge across the Nigliq Channel. The Division of Habitat considered the importance of the Nigliq channel for spawning, rearing and migration of anadromous whitefish, Dolly Varden, and pink and chum salmon, in reaching its decision to issue the permit. It also analyzed the potential for scour and concluded that CPAI's new proposed bridge, which would effectively span the entirety of the Nigliq Channel two-year floodplain or the bankfull width, "significantly reduced the potential for scour of a magnitude likely to change the character of the river downstream from the bridge." Fish & Game found that

CPAI's Nigliq Channel bridge, "would be the least restrictive stream crossing structure on the North Slope." Fish & Game concluded that CPAI's revised bridge plan would have minimal impact on fish and wildlife habitat in the Colville River Delta area.

The State of the Alaska's decisions and opinion are entitled to considerable deference by the Corps. Under 33 CFR 320.4(j)(1), due consideration shall be given to the state's official views on the activity for which permitting is requested.[2] 33 CFR 320.4(j)(2) provides that the primary responsibility for determining land use matters rests with the state and local communities.[3] In addition, the Corps must include in its decision document an explanation why significant national interests are overriding in importance, if its decision is contrary to state or local decisions.[4] If there are conflicting comments about the state's position on a particular permit request, the district engineer is required to ask the Governor for his views.[5] Further, permit decisions are required to be elevated to the division engineer when the recommended decision is contrary to the written position of the Governor of the state in which the work will be performed.[6]

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2 "Even if official certification and/or authorization is not required by state or federal law, but a state, regional, or local agency having jurisdiction or interest over the particular activity comments on the application, due consideration shall be given to those official views as a reflection of local factors of the public interest." 33 CFR 320.4(j)(1).

3 "The primary responsibility for determining zoning and land use matters rests with state, local and tribal governments. The district engineer will normally accept decisions by such governments on those matters unless there are significant issues of overriding national importance." 33 C.F.R. 320.4(j)(2).

4 "If the district engineer makes a decision on the permit application which is contrary to state or local decisions (33 C.F.R. 320.4(j)(2) & (4)), the district engineer will include in the decision document the significant national interests and explain how they are overriding in importance." 33 C.F.R. 325.2(a)(6).

5 "A proposed activity may result in conflicting comments from several agencies within the same state. Where a state has not designated a single responsible coordinating agency, district engineers will ask the Governor to express his views or to designate one state agency to represent the official state position in the particular case." 33 C.F.R. 320.4(j)(3).

6 In letters dated March 4, 2010, and March 29, 2010, to the Army Corps, the Governor of the State of Alaska communicated his objections to the Corps' failure to elevate the permit decision to the division engineer, as is required by 33 CFR 325.8(b). The Corps responded that elevation was not warranted because the Governor's communications, "did not constitute 'the written position of the Gov.'" Letter from Brigadier General Yenter to Governor Parnell dated April 12, 2010. The Governor communicated his written position through his Commissioner of Natural Resources and met personally with the district engineer to communicate support for CPAI's proposal. Therefore, the State continues to believe that the Corps' insistence on a formal written position from the Governor, despite the Governor's clearly expressed statements in support, is an incorrect interpretation of 33 CFR 325.8(b).

But the ROD appears to ignore or minimize the significance of the land use and permitting determinations made by the State of Alaska, as well as Governor Parnell's clearly expressed support for CPAI's proposal. For example, on July 10, 2009, DNR wrote a letter supporting CPAI's proposal, including the bridge across the Nigliq Channel. The District Engineer dismissed DNR's letter, asserting in his decision that "the current proposal is not for a full-span bridge of the Nigliq channel as stated in [DNR's] letter." ROD at 21. Although DNR's description may be imprecise under technical engineering definitions, DNR was making a point about the functionality and design of the proposed bridge that deserved a considered, respectful response from the Corps. The proposed bridge would effectively span the bankfull Nigliq Channel; it just would not free span it.[7] Although support pilings located in the Channel would support the bridge, the bridge would function, for all practical purposes, as a full-span bridge for scour control and mitigation purposes. See Attachment 1 (Opinion on Nigliq Channel Pipeline Crossing Scour Report by Louis Kozisek, Chief Engineer, State Pipeline Coordinator's Office). It would be the first bridge design to span the bankfull width of a large to moderate size river on the North Slope, where most bridges are built with the abutments *well inside* the bankfull width. The Division of Habitat concluded that the proposed Nigliq bridge would minimize impacts to the channel and thereby to fish resources in the channel. Regardless of the specific word choice used by DNR, the intent of its statement should have been clear to permitters familiar with bridge design. The State asks that it be allowed to participate in the conference and appeal process in order to clarify the administrative record on this issue.

The ROD ignored the clearly stated preference of the State and other landowners and found that two alternatives, both of which incorporate HDD, were the LEDPA. Under 33 C.F.R. 325.6(a)(6), the district engineer must explain the significant national issues that are overriding in importance if the district engineer's decision on a permit application is contrary to state or local decisions. The ROD's explanation is both cursory and conclusory, in finding that, "[i]n light of the ecological importance of the [Colville River Delta] and the availability of other alternatives, the Corps believes that denial of the permit is in the national interest as described in 33 C.F.R. 325.2(a)(6). ROD at 66.

The ROD concluded HDD alternatives were preferable because they "primarily avoided impacts to the Colville River Delta." ROD at pages 11 and 13. For the reasons stated below, the State disagrees that HDD is less environmentally damaging than CPAI's proposed bridge in this particular circumstance. The State requests that it be allowed to participate in the appeal conference in order to clarify elements regarding why HDD is not the LEDPA.

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[7] A free span bridge would require large suspension towers on both banks and suspension cables for support – a completely impractical structure for the area. The District Engineer's assumption that DNR advocated this sort of project for the Nigliq channel crossing is farfetched.

III. An Aboveground Crossing Over The Nigliq Channel Is Less Environmentally Damaging Than A Horizontally Directional Drilled Pipeline Below The Waterway.

The District Engineer gave inadequate consideration to potential environmental consequences of an HDD project, in weighing the impact of an HDD project versus CPAI's proposed bridge across the Nigliq Channel. The ROD recognizes that the HDD project does pose some environmental risks. The ROD noted that the underlying substrate of the HDD crossing could be subject to thaw settlement if a pipeline melts ice inclusions. The ROD also noted that, "[a]nother source of potential fish habitat disturbance is a potential frac-out or loss of drilling fluid during the boring of the HDD." And, "[t]he HDD does present additional possibilities for spills including the loss of drilling fluids and small undetected leaks in the pipe itself." ROD at 49.

But the District Engineer ignored the problems with corrosion monitoring and mitigation involved in HDD installations. The United States Environmental Protection Agency (EPA) and Fish and Wildlife Service similarly minimize or ignore the potential problems. Yet these are serious considerations that merit more than the cursory review given by the district engineer.

An HDD pipeline may be a practicable and environmentally preferable method under certain circumstances. It should have been evaluated, however, in light of the unique geotechnical requirements of the Nigliq Channel site.[8] Generally, an aboveground crossing offers better opportunities for corrosion control and integrity monitoring. An elevated pipeline can be more easily investigated by a variety of tested and developed programs for nondestructive examination (including visual inspection), external corrosion direct assessment, and internal corrosion direct assessment. In addition, mitigating and repairing damage to an aboveground pipeline causes less environmental disruption than would removal and repair of a buried pipeline. These considerations are critical when applied to the Nigliq Channel site because the nature of the site as well as the material that will be transported through the pipeline pose increased risk for corrosion.

The proposed CD-5 pipeline will transport unprocessed three-phase fluid (oil, gas, and water). Corrosion rates are typically much higher for this service than for single-phase transports. Further, an HDD crossing of the Nigliq Channel will require a large change in elevation. This increases the risk of water and sediment (and where conditions allow, wax and scale) accumulation, creating conditions conducive to increased corrosion, particularly microbially-induced corrosion. Louis Kozisek, Chief Engineer with the Alaska State Pipeline Coordinators Office, has prepared a preliminary report comparing the best method for crossing

[8] The ROD or its supporting documents mistakenly draw comparisons between an HDD crossing of the Nigliq Channel and the existing Colville crossings. The State disagrees that the Colville crossing offers proof that a less environmentally disturbing and technically feasible alternative exists. See Attachment 2.

waterways and streams, given the choice of utilizing HDD or aboveground crossing (Attachment 2). He states:

> Where technically and financially feasible and where there are no special design considerations, aboveground pipelines are to be preferred for a variety of maintenance, monitoring, integrity and repair reasons. We now have over three decades of experience with oil facilities and pipelines in arctic and subarctic Alaska. We know much more about what works best in the long term than at the time of original construction. As a broad principle, aboveground modes have demonstrated their advantages and are, in my opinion, the preferred choice for long-term maintenance and integrity of pipelines.

For these reasons, the State concludes that CPAI's proposed bridge would have fewer adverse environmental consequences for aquatic, subsistence and cultural resources than the HDD alternatives. The ROD fails to address corrosion and monitoring issues with HDD in reaching its conclusion that HDD would achieve the overall project purpose with substantially less impacts to the Colville River Delta.

The federal permitting agencies' minimization of the State's concerns is further demonstrated by a March 19, 2010, letter from the Regional Administrator at the US Environmental Protection Agency to Arctic Slope Regional Corporation. In that letter, the Regional Administrator defends EPA's advocacy of HDD, arguing, among other things, that a "HDD buried pipeline under the Nigliq Channel would represent approximately 5% of the overall 6.1 mile long aboveground pipeline system proposed by CPAI for the CD5." But that 5% crosses land directly below the State of Alaska surface interest. Any leak or environmental degradation caused by a buried pipeline could, and probably will, result in harm to the State's interest. The pipeline crossing is the most ecologically sensitive area on the route. A spill anywhere else is likely to be locally contained; a spill into the Nigliq Channel could contaminate not only the channel but also the Colville River and the coastal area. A small leak under ice would be difficult to detect and remove.

It is by no means clear that the State will consent to an HDD pipeline under its land, particularly if the State believes that a bridge crossing is, in fact, the LEDPA. Thus, the district engineer's conclusion that HDD is a practicable alternative may not, in fact, be correct. The State should be allowed to participate in the appeal conference and subsequent proceedings in order to insure that its interests in its land are protected.

The State also has other, direct interests in the Corps' permit decision, including protection of its citizens' rights to subsistence use, economic development and economic diversification of the surrounding area, royalties and revenue from development of its natural resources, and environmental protection of all lands within its borders.

For all of these reasons, the State respectfully requests an invitation to attend the appeal conference and further proceedings in this matter.

Respectfully submitted this 30th day of April, 2010.

DANIEL S. SULLIVAN
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By: _____

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MEMORANDUM

Department of Natural Resources

State of Alaska

State Pipeline Coordinator's Office

TO: Frederick M. Thompson

DATE: April 22, 2010

FROM: Louis Kozisek, PE
Chief Engineer

FILE NO: NA

SUBJECT: Opinion on Nigliq Channel Pipeline Crossing Scour Report (Rev. 1)

Reviewed Document: CD5 Alpine Satellite Development Project, June 2009, 114536-MBJ-2D-2009 Pages 6-1 to 7-2

Purpose

The following is a response to a request for an opinion on the adequacy of a ConocoPhillips scour report (referenced above). The Corps of Engineers and the EPA had criticized the company's selection of a bridge for a pipeline crossing, in part, because it would produce scour, sedimentation, and erosion.

Background

I have been involved in the Trans-Alaska Pipeline and in the North Slope oilfield facilities and pipelines for 31 years. That time has been spent in various capacities, working for pipeline and oil companies, as an engineering consultant and in government technical oversight. In my present position, I have responsibilities involving most of the long-distance transmission pipelines on the North Slope.

Discussion

Baker Engineering produced the scour analysis and wrote the report, although PND Engineering supplied the bridge geometry used in the analysis. To assess scour or sedimentation, Baker used a two-dimensional surface model, and checked it with a one-dimensional HEC-RAS model. HEC-RAS is software developed by the Hydrologic Engineering Centers River Analysis System, a part of the US Army Corps of Engineers. In addition, Baker estimated scour using Froehlich and HIRE algorithms and utilized a Federal Highway Administration standard for scour, HEC-18. These are well established methodologies that are utilized in a number of applications, including Federal design, such as the Corps of Engineers and the Federal Highway Administration. Both methodologies are accepted for use by HEC-18.

The SPCO asks that all major pipeline crossings be designed to a standard. Nearly every design basis that has included a trenched, HDD, or bridge for a pipeline crossing has utilized HEC-18. A pipeline crossing design that conforms to HEC-18 would have been considered adequately designed for scour, unless extremely unusual site conditions exist. As an additional step, to cross-check the HEC-18 calculations, Baker used a methodology called ABSCOUR. This is a widely accepted alternative to HEC-18 that is used by the US Geological Survey and others.

Results

In bridge design, several types of scour are evaluated, but the most important are pier scour, in-channel scour, and embankment scour. Pier scour is the scour surrounding the pier. Scour is

evaluated at piers to prevent undermining and subsequent pier failure. It is localized at the piers and is not relevant to discussions of general area scour or sedimentation. In-channel (or contraction) scour is the result of restriction of flow between piers and the subsequent increase in flow velocity directly downstream of the open channels. Embankment scour is the scour at the bridge embankments. The banks are proposed to be armored, or protected, so embankment scour predictions at the bridge are not discussed. In addition, the model predicts no additional embankment scour downstream of the bridge. Therefore, in-channel scour is assumed to be the type addressed by the Corps in their denial of a permit for the bridge.

The Baker model predicts the following for in-channel scour:

1. No additional scour (beyond natural bed scour) during a 10-year flood event (refer to Table 6.1).
2. Approximately four inches (0.3 feet) of additional scour (beyond natural bed scour) during a 50-year flood event (refer to Table 6.2).
3. Approximately 17 inches (1.4 feet) of additional scour (beyond natural bed scour) during a 200-year flood event (refer to Table 6.3).

It should be noted that the bed load (sediments) should fill in these minor holes after a flood event. In addition, the first paragraph on page 6-8 states that, "... no bank erosion is expected."

Graph 6.3 and information on page 6-2 indicate that nine 48-inch pier sections are used in a 1400-foot length. In other words, only 2.5% of the river cross-section is being blocked by this structure under normal flow conditions.

Conclusions

If this design were presented to the State Pipeline Coordinator's Office for a technical review, I would recommend that the SPCO accept the design with no modifications. The work performed by the engineer utilized standard analysis methods and software.

Only nominal amounts of in-channel scour are predicted for the site. Under normal flow conditions, only a small amount of the flow cross-section of the channel will be blocked by the bridge. Pier and bank erosion are localized and accounted for in the design. No sedimentation is predicted.

Had the analysis shown excessive scour, I would have looked at other options, rather than recommend horizontal directional drilling (HDD). In particular, I would have:

1. Asked for additional geotechnical borings, to see if underlying gravel or other soils that would mitigate scour existed at the site. The analysis conservatively assumed a finer soil more susceptible to scour.
2. Suggested common erosion control techniques, such as placing concrete erosion armor or cobbles and gravel on the bed of the channel under and immediately downstream of the bridge.

Subject: Opinion on CPAI Scour Report

These and other simple and proven countermeasures are available if analysis reveals scour to be problematic. However, I see nothing in the report that does not conform to generally accepted engineering methodology or good design practice for mitigation and control of bridge scour.

Louis Kozisek, PE

cc: Anne Brown
Don Perrine
Dick Lefebvre
Tina Kobayashi

MEMORANDUM
Department of Natural Resources

State of Alaska
State Pipeline Coordinator's Office

TO: Tina Kobayashi

DATE: 30 April 2010

THROUGH: Mike Thompson
State Pipeline Coordinator

FILE NO: NA

FROM: Louis Kozisek, PE, PMP
Chief Engineer, SPCO

SUBJECT: Opinion on Aboveground vs. HDD Waterway Crossings on the North Slope

Purpose
The following is in response to a request for an opinion on the best method for crossing waterways and streams, given the choice of utilizing horizontally directional-drilled (HDD) or aboveground crossings. Each crossing type has its own merits, so engineers must evaluate the method of crossing at each site. However, certain broad principles can be useful in selecting the best method.

Background
I have been involved in the Trans-Alaska Pipeline and in the North Slope oilfield facilities and pipelines for 31 years. That time has been spent in various capacities, working for pipeline and oil companies, as an engineering consultant and in government technical oversight. I have professional registrations in mechanical and civil/structural engineering. In my present position, I have responsibilities involving most of the long-distance transmission pipelines on the North Slope, including the Alpine pipeline and the HDD crossing at the Colville River.

Discussion
There have been a number of engineering, financial, and environmental arguments offered for either HDD or aboveground crossings of the Nigliq channel. I will discuss what I consider the most important engineering considerations in selecting a type of crossing.

Engineers consider many items before finalizing a design. I have watched the pipelines and the facilities age on the North Slope over the past three decades. My opinion is that the various aspects of maintaining integrity over years of service have too often been given insufficient consideration in the original design.

Although HDD crossings have certain advantages, such as better resistance to flooding and ice breakup, an aboveground crossing offers better opportunities for corrosion control and integrity monitoring. These two aspects become increasingly important as pipelines age, and should be given prominence in selection criteria.

The Trans-Alaska Pipeline provides an example of this general principle. Originally, half of the pipeline was buried and half elevated. Now, after a number of changes, 380 miles are buried and 420 miles are elevated. Engineers and maintenance managers report that the cost of maintenance and repairs, and the extent of external corrosion, is much lower on the elevated section. Many express the wish that much more of TAPS had been constructed in the elevated mode.

This demonstrates certain broad principles important to the selection of a pipeline crossing. Where possible, a pipeline that is in an elevated location is more maintainable and easier to monitor. An elevated pipeline can be more easily investigated by a variety of tools for non-destructive examination (NDE), external corrosion direct assessment (ECDA) and internal corrosion direct assessment (ICDA).

In addition, the pipeline operators have developed programs for monitoring elevated pipelines via ground inspections, visual air inspections, and forward-looking infrared (FLIR) surveys. The advantages of being able to monitor continuously a pipeline section by these means become increasingly obvious as the installations in the arctic and subarctic age.

While it is true that advances in smart pigging have improved assessment and monitoring of buried pipeline sections, this technique is not without its flaws and limitations. The relative ease of access to elevated pipelines still offers many advantages for pipeline integrity programs.

To overcome some of the disadvantages of a buried crossing, the designers of the Alpine Colville crossing incorporated special features not found in most other HDD crossings. These include such items as a separate, specialized leak detection system and several corrosion prevention measures. This crossing has operated successfully for a decade. However, this crossing remains a unique example of a North Slope HDD installation. The vast majority of pipeline crossings on the in this region are still aboveground, demonstrating that this is the tried and true method.

There should be caution in applying the experience of the Colville crossing to other sites, especially to the Nigliq Channel. The geotechnical requirements of each site are different, and the two pipelines are fundamentally different. The Alpine pipeline transports sales quality oil processed to TAPS specifications, with a limit of 0.35% BS&W (sediment and water). In contrast, the CD5 pipeline transports unprocessed three-phase fluid (oil, gas and water). The corrosion rates are typically much higher in this type of service.

If the Nigliq Channel pipeline crossing is constructed using HDD, it will be unprecedented on the North Slope. It will be the first use of HDD for a three-phase (oil, gas and water) pipeline. Any pioneering engineering design introduces special risks, some not fully appreciated until after considerable operating experience. One aspect that should be considered with caution is that this pipeline has the potential to pocket flow.

The broad experience base of operating three-phase lines on the North Slope has shown that where these lines change in elevation, water and sediment (and where conditions allow, wax and scale) accumulate, creating conditions conducive to increased corrosion, especially microbially induced corrosion (MIC). Because of its large change in elevation, an HDD crossing of the Nigliq has potentially greater risks. The topography in this area of the North Slope is flat. Typical elevation changes in three-phase pipelines are in the range of three to twelve feet.

In my opinion, the technical feasibility of a HDD crossing of Nigliq is indeterminate. In particular, more work is needed to determine feasibility in the area of flow assurance. In three-phase pipelines,

changes in elevation can create flow problems, including a phenomenon known as "slugging". This occurs when a pipeline transitions from laminar or turbulent flow into a flow regime where liquid and water separate and travel downstream as pockets, or "slugs", that are mainly gas or mainly liquid. This condition can create several problems, in addition to those previously described. It can reduce flow. Corrosion inhibitors and biocides (if added) do not coat the inside of the pipe as evenly as in turbulent or laminar flow. Maintenance pigs do not clean as well. Dynamic flow modeling is needed to determine if an HDD crossing has the potential to create slugging or other flow impedances in the CD5 pipeline. However, slugging is still not a completely understood phenomenon, so risks would remain even if a computational flow model predicted no problems.

Recommendation

Where technically and financially feasible and where there are no special design considerations, aboveground pipelines are to be preferred for a variety of maintenance, monitoring, integrity and repair reasons. We now have over three decades of experience with oil facilities and pipelines in arctic and subarctic Alaska. We know much more about what works best in the long term than at the time of original construction. As a broad principle, aboveground modes have demonstrated their advantages and are, in my opinion, the preferred choice for long-term maintenance and integrity of pipelines.

Louis Kozisek, PE, PMP

cc: Don Perrin

This is to certify that on April 30, 2010, true and correct copies of the foregoing document were sent by U.S. Mail, postage paid, to the following parties:

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